

**Blackwood Creek Reach 6 Stream Channel Restoration
Effectiveness Monitoring Report**

January 2014

**Peer Review Comments and
Responses**


The LTMBU would like to thank Maureen McCarthy, the Tahoe Science Consortium, and specifically, the three peer reviewers, for providing a thorough, thoughtful and insightful review of this report.

**TAHOE SCIENCE CONSORTIUM PEER REVIEW
USFS - LAKE TAHOE BASIN MANAGEMENT UNIT
(MARCH - APRIL 2013)**


BLACKWOOD REACH 6 RESTORATION DESIGN PLANS

Peer Review Questions:


1. Are the analysis techniques presented in the report technically sound (i.e., are there identifiable flaws in the data analysis that compromises the accuracy of the derived results)?

The methods descriptions are brief and included in other references that should be brought into the report. 

2. Have the identified flaws in the sampling design and sampling implementation been sufficiently described and appropriately considered in the analysis?

The missed sampling and changes in sampling protocols are identified and recognized, though there is little technical support indicating that estimated values (e.g. streambank erosion fractions) from one protocol to the next are legitimately comparable, though plausibly so. 

3. Are the conclusions regarding restoration effectiveness reasonable, based on the analysis?

From the information gathered, it appears that restoration efforts have been mostly effective towards meeting the project "goals"; however, there were no hypotheses tested, management model outlined, nor possible corrective management actions described suggesting how "effectiveness" would be attained or sustained when targets are reached. Thus the potential to learn from this project may be limited to largely subjective interpretation of observations and data. 

4. Do you have any suggestions for improving the clarity, quality, completeness of the analysis and interpretation of results (based on available data), to support conclusions regarding restoration effectiveness?

The report would be enhanced from a scientific perspective through presentation of testable hypotheses and adoption of peer-reviewed journal type standards for referencing key supporting facts and related protocols found in the literature. Further, developing and applying a true adaptive process aimed towards outcomes

Number: 1 Author: snorman Subject: Sticky Note Date: 5/19/2013 2:14:14 PM -07'00'

And this is intentional for a management agency report, which is different than the needs for scientific journal publication. Our requirements are that references for methods are cited, and readily available within the agency, for the use of those that conduct future monitoring.

Number: 2 Author: snorman Subject: Sticky Note Date: 9/19/2013 11:16:20 AM -07'00'

We will add additional information to strengthen the numerical analysis where possible (ex. aerial and ground based photos and contractor assessment reports). We do not agree that the conclusions based on R5 and R6 SCI data comparisons are not justified, based on our first hand field experience and observations at this reach. This numerical data is not in conflict with what we visually have seen and discussed with our peers and contractors over the years. We will emphasize more strongly the uncertainty using different protocols introduces to the numerical comparisons.

Number: 3 Author: snorman Subject: Sticky Note Date: 1/12/2014 10:03:35 AM

You are right in that specific criteria for, or descriptions of, possible corrective or additional management actions have not been postulated, because we don't know what that would look like. We believe that can only be determined using a more loose process of evaluating our data and observations against our management goals, and collaboratively discussing what we find with our peers both within and outside the agency (who have stream channel restoration experience) to determine when and if corrective or additional restoration actions are needed. A certain amount of subjectivity in this process is just the reality. We agree with all the reviewers comments regarding the degree of "certainty" we can claim in our numerical analysis. We do believe that experienced practitioner's however will find usefulness even in our "uncertain" data, because of the body of evidence provided that as a whole support our subjective interpretations.

(linked to goals) would allow projects such as this one to further our knowledge base and would help improve future projects as well as enhance this one, particularly where things did not go as planned. While this would require close coordination with regulatory agencies, it is a critical element of improving real (versus predicted or modeled) water quality and stream function in the Tahoe Basin. See “General Overview” above.



Number: 1 Author: snorman Subject: Sticky Note Date: 1/12/2014 10:09:21 AM

We will strongly consider how to utilize the suggestions you have made (development of management model and articulation of testable hypothesis) in our monitoring plan for future data collection. We do feel you have confused testable hypothesis that are appropriate at the reach scale, with those appropriate at the watershed scale, and that will need to be considered when articulating our future monitoring and reporting strategy for this watershed. Our current monitoring strategy identifies the metrics we believe will be the most cost effective at evaluating long term trends related to geomorphic process, and are designed to be able to determine whether the Blackwood TMDL targets are being met. In the short term, the information in this report met our current needs in determining 1) whether the fundamental aspects of the restoration approach appear to be successful in showing a positive trajectory in meeting restoration goals and 2) whether any adaptive management actions are needed at this time. Enhanced monitoring regarding the effects of improved stream geomorphic function on water quality, has been initiated by others, in more urbanized watersheds in the Tahoe Basin. (Trout and Upper Truckee).


Review 1:
Blackwood Creek Reach 6 Restoration (Phase IIIA) – Effectiveness Monitoring Results
Draft Final – February 2013

The peer review charge questions given to us are:

- 1) Are the analysis techniques presented in the report technically sound (ie. are there identifiable flaws in the data analysis that compromises the accuracy of the derived results)?
- 2) Have the identified flaws in the sampling design and sampling implementation been sufficiently described and appropriately considered in the analysis?
- 3) Are the conclusions regarding restoration effectiveness reasonable, based on the analysis?
- 4) Do you have any suggestions for improving the clarity, quality, completeness of the analysis and interpretation of results (based on available data), to support conclusions regarding restoration effectiveness?

These questions will be answered individually below followed by some additional specific comments.

- 1) Are the analysis techniques presented in the report technically sound (ie. are there identifiable flaws in the data analysis that compromises the accuracy of the derived results)?

There is a major flaw in the analysis techniques with regard to their inconsistency. Prior to the implementation of the restoration, Region 5 Stream Condition Inventory (SCI) monitoring protocols were used, and these are stated to be “are already designed to ensure a level of measurement consistency sufficient for project monitoring” (page 7). After the restoration, Region 6 SCI protocols were used, which “is considered an assessment tool that can be used as a basic monitoring tool, provided a stringent level of quality control is applied in application.” The latter statement causes concern in itself – were such stringent quality controls implemented in the Region 6 SCI? Even if they were, the different metrics used pre- and post-restoration preclude rigorous, meaningful comparisons of the pre- and post-results of the SCI’s. There are also some irregularities in the timing, spatial extent, and completeness of these inventories that are detailed on page 7 that compromise pre- and post-SCI comparisons, regardless of how stringent the quality control is for the latter. This reviewer recognizes that the authors of this report may not be responsible for these irregularities, many of which occurred in the past, but the above comments must nevertheless be on the record in response to the first charge question. 

- 2) Have the identified flaws in the sampling design and sampling implementation been sufficiently described and appropriately considered in the analysis?

The identified flaws have been sufficiently described so that this reviewer can see the problems, but they are not appropriately considered in the analysis. Specifically, the statement on the bottom of page 7 and top of page 8, which helps set the stage for the rest of the report, is problematic: “it is assumed that data collected with either protocol accurately represents median values for metrics within the particular reach characterized, and *differences in results due to protocol differences will be comparatively small.*” (*emphasis added*). Without some field comparison of the two methods, this statement represents merely an opinion without any foundation in fact.

Summary of Comments on Microsoft Word - Review1 Blackwood Canyon Restoration.docx

Page: 1

Number: 1 Author: snorman Subject: Sticky Note Date: 5/17/2013 12:03:20 PM -07'00'

Yes, we do believe stringent quality control was applied in application of surveys using Region 6 protocols, based on our personnel knowledge of level of training and expertise of individuals performing the work. We agree with your finding that the difference in protocols compromises the rigor of comparisons. But we still believe the comparisons are meaningful. We had the choice of 1) doing what we have done, 2) not including any of this data and analysis in the report, and relying solely on other information, or 3) doing a rigorous comparison of protocols to strengthen the rigor of our analysis. Based on our budget limitations, and the level of data needed to address our management needs, we chose to do 1). But we will add even more caveats in the report regarding how this situation compromises the rigor and degree of confidence we have in results, where data from Region 5 SCI protocols were compared to Region 6 SCI protocols.

Table 2 provides some fairly convincing data, assuming that this metric was measured in a consistent manner over time. ¹ But there is still quite a long time period between measurements, raising the issue of natural temporal variability. ² Table 3 on page 10 compares estimates of percent stable banks over time, with large gaps in time periods, raising the question of what the changes would have been without any restoration, and then compares the post-restoration R6 results with the past estimates, ten years earlier, using R5 protocols. ³ The statements below this table simply cannot be supported by the data, particularly the statement that "Regardless of the amount of error that may be introduced from comparisons of data obtained from using different protocols, it is clear that the restoration project has helped considerably in meeting the TMDL target of 80% stable banks in the short term." The table does show good results for the restored reach, and that certainly can be claimed, but the authors cannot simply dismiss the irregularities in protocols and long time periods between samplings out of hand. ⁴ Also, are the differences between the RR4, restored reach, and RR6 significantly different? ⁵ If the authors could conduct a field comparison of the two SCI protocols on one site and at one time, it would greatly help them build their case, and I strongly urge that this be done. ⁶

3) Are the conclusions regarding restoration effectiveness reasonable, based on the analysis?

In some cases, specifically those using the R5 and R6 SCI data, the conclusions are not justified based on flaws in monitoring methods. ⁷

4) Do you have any suggestions for improving the clarity, quality, completeness of the analysis and interpretation of results (based on available data), to support conclusions regarding restoration effectiveness?

I strongly urge that at least three comparison studies be done comparing the R5 and R6 protocols on the same site at the same time. If the results of these comparisons are favorable and statistically sound, it would add greatly to the credibility of this report. ⁸

Other Specific Comments:

p. 11, Figure 3: It would be helpful to supply precipitation or snowpack data along with this to get some idea of how much of the variation could simply be due to variation in those parameters. Also, there are no units on the y axis. ⁹

p. 14, second paragraph: I confess to being very confused by this. Also, provide explanations of that 7a and 7b are in the legend of Figure 7. ¹⁰


p. 17, paragraph 3: Do NOT ask the reader to re-read the "non-ideal circumstances" – summarize them again here. ¹¹

p. 21-24, Tables 6 - 9: Same problems here with different protocols over time and the long time period in itself. ¹²

p. 25, paragraph 2 and Table 10: This is very good – even better would be to compare the entire set of protocols. ¹³

-
- Number: 1 Author: snorman Subject: Sticky Note Date: 5/16/2013 4:22:20 PM -07'00'
Yes, was measured consistently, same protocol used for surveying longitudinal profiles
-
- Number: 2 Author: snorman Subject: Sticky Note Date: 5/16/2013 4:24:20 PM -07'00'
Although we do not have longitudinal thalweg survey profiles during this 10 year period, we do have aerial photos that can be used to calculate channel sinuosity, between 2001 and 2011. Will add this data and analysis to this section.
-
- Number: 3 Author: snorman Subject: Sticky Note Date: 9/18/2013 1:54:42 PM -07'00'
We have other information (photos and contractor assessment reports) that describe what happened to this reach (massive destabilization) as a result of the the 2005 flood, and the trajectory of continued degradation until restoration work began in 2009. Will add this data and analysis to this section.
-
- Number: 4 Author: snorman Subject: Sticky Note Date: 5/16/2013 4:30:45 PM -07'00'
Agreed, will add stronger language to that already in the report that describes uncertainty this situation creates in the analysis.
-
- Number: 5 Author: snorman Subject: Sticky Note Date: 5/17/2013 12:04:08 PM -07'00'
We will add analysis to describe the degree to which metrics for RR4 and RR6 were numerically and/or statistically different,.
-
- Number: 6 Author: snorman Subject: Sticky Note Date: 5/16/2013 4:37:25 PM -07'00'
The reality is we have no budget for that. The best we can do is to implement consistency in the future, which is documented in our updated monitoring plan for this project.
-
- Number: 7 Author: snorman Subject: Sticky Note Date: 9/18/2013 1:56:49 PM -07'00'
We will add additional information to strengthen the analysis where possible. We are not convinced that conclusions based on R5 and R6 SCI data numerical comparisons are not justified, based on our first hand field experience and knowledge of this reach. The numerical data is not in conflict with what we visually have seen and discussed over the years with our peers and contractors. As stated above we will emphasis more strongly the uncertainty using different protocols introduces to the numerical comparisons. We will attempt to add additional information from other sources to strengthen the numerical analysis where possible.
-
- Number: 8 Author: snorman Subject: Sticky Note Date: 5/16/2013 4:48:59 PM -07'00'
As stated above , this is simply not feasible based on current and future budgets. We can only hope to prove in future analysis and reports that the positive trends we describe here, are corroborated over the long term.
-
- Number: 9 Author: snorman Subject: Sticky Note Date: 9/18/2013 1:57:44 PM -07'00'
We will add units, and add discussion on water year type based on nearest snowtel data site.
-
- Number: 10 Author: snorman Subject: Sticky Note Date: 5/17/2013 11:46:08 AM -07'00'
Yes, I found mistakes in what the figure numbers were referred to. Will correct mistaken figure references, and provide clarification about photos 7a and 7b.
-
- Number: 11 Author: snorman Subject: Sticky Note Date: 5/17/2013 11:46:44 AM -07'00'
Agreed, I will summarize them again here.
-
- Number: 12 Author: snorman Subject: Sticky Note Date: 5/17/2013 11:48:04 AM -07'00'
I have addressed this concern in my previous responses, so will not repeat.
-
- Number: 13 Author: snorman Subject: Sticky Note Date: 9/18/2013 1:59:13 PM -07'00'
Agreed, but the value added does not justify the time or funding this would take.

p. 26, bottom paragraph: Since only 2011 data are available, it is not really possible to evaluate treatment effects in a rigorous manner  ¹

p. 30, paragraph 5: Yes, this improvement of QA on protocols is vital and could be greatly improved by expanding the comparisons done in Table 10  ²

Number: 1 Author: snorman Subject: Sticky Note Date: 5/17/2013 11:51:32 AM -07'00'

Comparison to reference reaches are not as rigorous as also being able to do pre and post comparisons, but is still meaningful. And will become even more meaningful over time in future monitoring.

Number: 2 Author: snorman Subject: Sticky Note Date: 9/18/2013 2:00:44 PM -07'00'

Yes we have made this clear under our monitoring recommendations, but again we feel we can live with the limitations in the data as described in this report, because the overall body of information was satisfactory for us to determine two key things

- 1) the overall trends show that the restoration project put the reach on the right trajectory
- 2) there are no corrective actions needed within this reach at this time

REVIEWER 2: REVIEW OF USFS BLACKWOOD CREEK RESTORATION MONITORING

GENERAL OVERVIEW

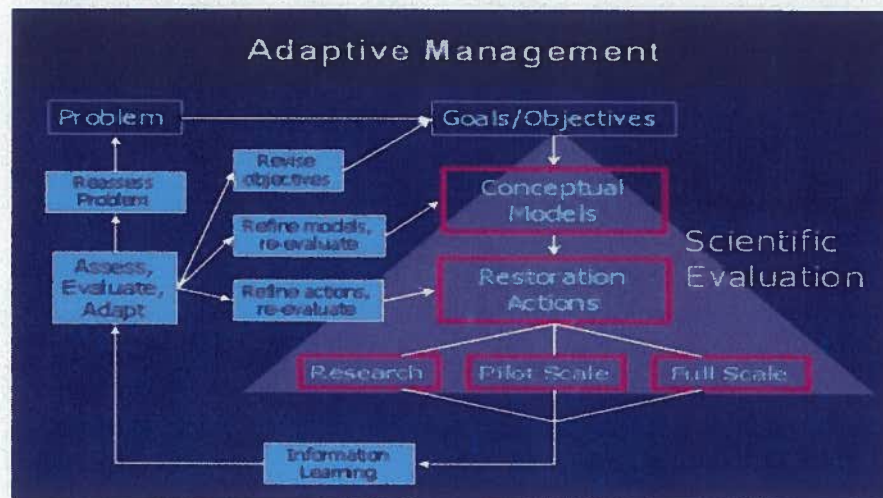
Blackwood Creek watershed on the Lake Tahoe west shore has long been recognized as a major source of sediment discharges to the Lake and the USDA-Forest Service (USFS hereafter) has developed several projects in the watershed directed at decreasing creek loading to the Lake. The report considered in this review summarizes a suite of monitoring efforts following about 1140 m of stream channel restoration work (Reach 6, Phase III) in the lower mild gradient (~0.6%) section of the creek during 2008-2009. While stream reach restoration projects are assumed to be beneficial, the risk with downstream or floodplain type restoration work is that it fails to address the watershed as a whole, focusing rather on "repairs" following major disturbance events such as the 1997 floods along the Lake Tahoe west shore tributaries. If upstream landscape soil hydrologic function (e.g. infiltration rates and capacity, dirt road drainage connectivity and routing, etc.) is not improved such that overland flowrates and sediment discharges decrease for a major storm or snowmelt event, downstream channel conditions will continue to adapt to upstream watershed conditions regardless of the downstream channel work completed. This latter observation has been especially true in the Blackwood Creek watershed following legacy timber harvesting, sheep grazing, gravel mining and widespread recreational activities in the past century or more.

Notwithstanding the watershed perspective, the USFS has completed extensive work in the Creek and this particular report considers work that was directed at restoring channel bank stability, channel sinuosity, riparian water tables and habitat, aquatic invertebrate density and diversity, inclusion of large woody debris (LWD) and sediment trapping efficiency following the channel straightening and incision resulting from the 1997 flood. Within changing climate context, the 1997 flood event is not considered to be particularly large and will likely occur more frequently underscoring the need for broader watershed considerations. For example, prior to the Reach 6 restoration work considered in this report, there was previous Rosgen-type driven restoration in 1993-95 that was lost in the 1997 flood. The USFS report acknowledges that fluvial geomorphological systems move towards a "dynamic equilibrium". That is, they tend to approach an equilibrium condition in which upstream landscape sediment and water discharges combined with overland flow channel density result in creation of a main channel morphology capable of discharging both water and sediment flows. When not otherwise geologically constrained, channel incision rates are matched by aggradation rates as channel meanders or bends slowly migrate downstream while overall sinuosity is maintained. Rather than adopt this observation at the watershed scale as noted above, it is applied at the local reach scale (Reaches 1 & 6, Phase III) in the Blackwood Creek floodplain following culvert replacement work upstream in the middle of the watershed (Phase 2).

Presumably, the implicit governing hypothesis for the restoration work was that through channel manipulation (increased sinuosity, placement of rock/LWD etc.), creek

ecosystem function (as yet to be defined but presumably includes factors such as sediment trapping, stream and riparian habitat etc.) will improve and downstream creek sediment discharges to Lake Tahoe will decrease (so as to help meet TMDL targets-objectives). The decreased sediment loading to the Lake would result from decreased channel incision rates, stream velocities (and associated shear forces) and streambank erosion combined with possible sediment deposition in the channel floodplain. There is a significant range in spatial and temporal scales associated with the processes implicit to both the governing hypothesis and the project goals. The monitoring report outlines six project goals, presented as both statements and (key management) questions, and associated monitoring activities directed at achieving each of these goals in the next 5-20 year time frame.

Each project goal could be put forth as a testable sub-hypothesis with an associated conceptual process model (perhaps numerical) that directs the type and frequency of monitoring as well as enables formation of alternative management strategies should individual project goals not be achieved within appropriate space- and time-frames. For example, Goal 1 stated as "Restore dynamic geomorphic channel stability to achieve and maintain Blackwood Creek TMDL targets for sinuosity (1.6) and bank stability (80% stable banks)" might be cast as Hypothesis 1, "increased channel bank stability and sinuosity will (a) decrease near streambed flow velocities and shear stresses, (b) increase fine sediment (~2 mm) deposition, (c) increase riparian area inundation frequency, and (d) decrease fine sediment discharge to Lake Tahoe". An associated flowchart type graphic (conceptual model) outlining the key processes involved in this hypothesis and the particular restoration steps (e.g. placement of rock/LWDs in channel) that specifically address each process would complement the hypothesis and provide a clear and transparent statement of the science associated with the project. Such a report-project development is not unique and has been applied to the restoration projects proposed and monitored as part of the Bay-Delta Program (e.g, DRERIP, 2005; see example graphic below). Of course, both overall and individual project goals could then be cast in an adaptively-managed science methodology from which new knowledge could be developed that is directly applicable to the management of Tahoe Basin west shore tributary watersheds.



Monitoring Specific Comments

Several monitoring methods and protocols were adopted for evaluating the relative success of the Reach 6 restoration. Survey and monitoring information from adjacent reference reaches are used for comparisons with the recognition that they are also in disturbed states, though not to the degree of the restored Reach 6. Each of the methods, as associated with the project goals are considered below.

1. **Photographic Surveys** – Both geo-referenced and aerial photo surveys were conducted pre- and post-project construction that provide valuable information about the relative channel position (sinuosity), floodplain inundation, plant species and density and other more qualitative factors. Regular digital photo surveys should be planned together with event driven surveys. In addition to the survey date, the streamflows should be noted and an effort made to repeat the surveys under similar hydrologic and seasonal conditions.
2. **Stream Channel Condition Inventories (SCIs)** – Two apparently similar methods (from USFS Regions 5 and 6) of characterizing the channel bank stability and fish habitat were deployed pre- and post-project that will likely be used in the future. The Region 6 method is considered an assessment tool, while the Region 5 method is considered a monitoring tool with associated sampling statistics. While both approaches suggest similar conclusions of improved stability and habitat, the differences between the methods will require articulation and how this might affect the conclusions drawn needs further assessment; perhaps a side-by-side comparison of method results following surveys by two different crews. Absent such a comparison, development of a new, perhaps hybrid method that has sufficient scientific basis to enable quantitative determination of relative progress along the trajectory of improved/sustained bank stability and habitat restoration may be required. As noted with the photo surveys, the SCI type monitoring efforts should be linked to similar flow and climate conditions from year-to-year.
3. **Vegetation Plots** – The project uses 15 established plots and the line-intercept method along 10 m transects oriented in all four principal directions. The report

Summary of Comments on Microsoft Word - Reviewer 2 Blackwood Canyon Review.docx

Page: 3

Number: 1 Author: snorman Subject: Sticky Note Date: 5/19/2013 1:03:56 PM -07'00'

Agreed, will add to monitoring recommendations, and will add calculated flow levels to photos in this report.

Number: 2 Author: snorman Subject: Sticky Note Date: 9/19/2013 10:52:31 AM -07'00'

We believe we did this clearly for each metric.

Number: 3 Author: snorman Subject: Sticky Note Date: 5/19/2013 1:10:23 PM -07'00'

In the future we will be using Region 6 protocols for the entire restored reach, RR4 and RR6. We will also continue Region 5 protocols in the historically established, Region 5 SCI reach. We will not need to compare data between Region 5 and Region 6 protocols under this scenario. The protocol for SCI surveys is during low flow conditions already, and since it is done at approximately 5 year intervals is meant to document the geomorphic changes that have occurred during the entire climatic and flow regime during that period.

does not describe if sufficient transects were used to provide adequate statistics; that is, often at least 5 transects in the plot area to determine the population standard deviation SD are needed to derive the appropriate sampling size to determine if the sampling is representative of the population of interest. While not specified and as noted above, the plant surveys should be conducted under similar flow and season conditions from one year to the next. An effort should be made to ensure that an equal length of total transect is measured each year for better statistical comparisons. On the other hand, combining the vegetation transect monitoring with a broader range of ecological indicators as suggested by the USDA-ARS (Herrick et al., 2006) for the western states may be appropriate. While Herrick et al.'s (2006) suggestion that long-term (~75 years) is required to evaluate revegetation success in the plains may appear excessive for the riparian vegetation along Blackwood Creek, such a long-term perspective may be useful when combined with the AM outlook outlined in the General Overview above. ¹

4. Channel-Floodplain Hydraulics – A hydrologic study was conducted to determine the relative frequency of floodplain inundation, channel flow velocities (shear stresses and estimation of scour/deposition volumes along the project reaches following the spring 2010 snowmelt. Determination of the bankfull floodplain inundation frequency was based on a downstream measured discharge of 250 cfs, but the floodplain dimension flooded were not provided ² or was the reference for the 250 cfs bankfull discharge estimation for Blackwood Creek. Similarly, presumably the basis for the 600 cfs estimation of full-project width ³ flooding was based on observed water level elevations during the peak flows of the 2010 spring runoff. An elevation-based water level metric may be useful for this determination of inundation frequency combined with repeated channel cross-section measurements at fixed locations from year-to-year ⁴. The HEC-RAS modeling study provided insights into average channel velocities expected given the measured channel cross-sections from which particle-sizes transported as part of bed and suspended loads can be estimated. However, with the exception of cross-section XS3, the measured cross-sections are all downstream of the restored Reach 6 – presumably the design cross-sections were used for the modeling and will be used in future monitoring efforts. Reference cross-section locations within the project reach section should be identified. While the model simulates channel water depths at various flowrates, was it used to estimate sediment transport downstream and modeling predictions compared with measured(?) sediment loads at the LTIMP station ⁵ or persistent downstream TSS and suspended particle-size monitoring information is provided and should be collected as part of the LTIMP monitoring by the USGS ⁶. Combining the aerial photo surveys together with regular channel cross-section measurements at fixed locations every 2-5 years, or following major flood events, should provide the quantitative information needed to determine relative rates of channel aggradation (by volume) in the study reach ⁷ as well as estimates of possible decreased downstream sediment loading to the Lake that may be associated

-
- Number: 1 Author: snorman Subject: Sticky Note Date: 9/19/2013 10:55:03 AM -07'00'
- We will be relying primarily on photopoints and stream shading measurements to assess overall trends in floodplain and channel vegetation. This protocol was designed to assess effectiveness of installed structures (which create backwater areas with fine sediment deposition) in promoting vegetation establishment, and believe the existing monitoring design will do that. We have clarified this in the report.
-
- Number: 2 Author: snorman Subject: Sticky Note Date: 9/19/2013 10:55:50 AM -07'00'
- Will add discussion in report on how we estimated flow levels within project from downstream guage.
-
- Number: 3 Author: snorman Subject: Sticky Note Date: 1/12/2014 9:50:51 AM
- We have added explanation in the report for how upstream flows were estimated using gaged data at the stream mouth.
-
- Number: 4 Author: snorman Subject: Sticky Note Date: 5/19/2013 1:27:05 PM -07'00'
- Our SCI cross sections (now 12 established in each reach) will tell us if bankfull width depth ratios are increasing or decreasing over time. Will clarify in report that these additional cross sections have been established.
-
- Number: 5 Author: snorman Subject: Sticky Note Date: 5/19/2013 1:28:56 PM -07'00'
- No, we do not feel we have the information and capacity to do this at this time.
-
- Number: 6 Author: snorman Subject: Sticky Note Date: 1/12/2014 9:57:34 AM
- We did not feel that sediment loading data collected at the mouth of Blackwood canyon was a good metric for evaluating what was happening in this reach. In 2011, we provided an exhaustive analysis to the LRWQCB that relates to this issue. Please see our report (Blackwood Implementation Effectiveness Report, 2011) on our website for more information on this point.
-
- Number: 7 Author: snorman Subject: Sticky Note Date: 9/19/2013 10:58:42 AM -07'00'
- Agreed, and that is what we have described in our monitoring plan.
-

with the reach restoration. This latter aspect was considered when examining channel cross-sectional changes pre- and post-1997 flooding. Moreover, it would provide a record of the rate of channel meander migration that might be expected, or ameliorated with additional upper watershed restoration effort.

5. Fish habitat - Rifles and pools, Sediment particle sizes, Shading, and LWD – The project thalweg and SCI surveys provided information about the increase in the number and depth of pools along the study reaches and indicated that the restored Reach 6 now has a pool frequency and depth (presumably m) that is consistent with the reference reaches. Similarly, channel sediment particle sizes have increased on average and fines fraction decreased such that the restored reach sediment is now comparable to that of the reference reaches. Perhaps there was a missed opportunity here in comparing or using the HEC-RAS modeling efforts to estimate particle sizes transported and deposited. Relative stream shading has also improved. The quantity of LWD in the restored reach, though seemingly improved, remains deficient and the USFS has plans to address this matter.
6. Macro-invertebrate communities – While stream shading and riffle pool frequency and sediment particle-size have increased, the report acknowledges that measured values remain below optimal levels suggested by other studies. A Tahoe-specific biological integrity index was used to evaluate macro-invertebrate communities and conflicting results were obtained. Based on the O/E metric, the three study reaches has similar indices and all were greater than the state threshold value. However, the IBI metric values were well below the state threshold value suggesting poor community structure for a mountain stream. While the IBI score for the restored Reach 6 was greater than that of the two reference reaches, it was only about half of the California state threshold value. These conflicting results suggest that there is a possibility of improvement in macro-invertebrate community structure or that the California IBI threshold is inappropriate for the Tahoe tributaries. Though the report concludes that based on the O/E metric, none of the study reaches are in “poor” condition in this regard, the discrepancy between the results from the two metrics requires greater explanation and justification for the final conclusion. Presumably, the macro-invertebrate monitoring will continue into the future using a standardized methodology such that changes or trends in community structures can be determined.

OVERALL MONITORING PROJECT CONCLUSIONS

This monitoring report considers pre- and post-project monitoring associated with stream restoration of Reach 6 in the Blackwood Creek lower floodplain. While a commendable effort the USFS has been engaged in stream restoration work for a few decades now in Blackwood Creek, the previous experience of this relatively recently adopted activity and responsibility of the USFS is not outlined with respect to the Reach 6 project. While such applied restoration work has been accomplished elsewhere within a scientific framework, the focus of the project was encapsulated in several restoration

Number: 1 Author: snorman Subject: Sticky Note Date: 5/19/2013 1:39:48 PM -07'00'

Just for clarification all currently planned large scale restoration work has been completed in this watershed, both in the upper watershed as well as within the stream channel. Will make sure this is clearly stated in report.

Number: 2 Author: snorman Subject: Sticky Note Date: 9/19/2013 11:05:34 AM -07'00'

Yes it is our understanding that this discrepancy between IBI and O/E threshold attainment is happening in other locations in California, and the State Water Board is trying to figure out why. It is also our understanding the Waterboard is still adjusting and refining macro sampling protocols and thresholds. We do not have any information to provide further explanation. We have provided some additional discussion in this section.

Number: 3 Author: snorman Subject: Sticky Note Date: 5/19/2013 1:52:27 PM -07'00'

We will not continue at this scale, and will rely on TRPA basinwide bioassessment program data only for this metric, as currently described under monitoring recommendations section.

goals rather than within the context of the entire watershed with testable hypotheses related to TMDL targets of decreased sediment loading to Lake Tahoe. [I was surprised that there was no mention of augmenting USGS (LTIMP) monitoring of Creek flows and sediment loads before and after the project to determine effects of restoration efforts on the ultimate TMDL goal.]¹ Such an approach is being developed for the smaller though similar Homewood Creek watershed to the south (Grismer 2012, 2013a, 2013b). These papers include some comparison to Blackwood Creek monitoring prior to this project implementation that may be useful towards further work in Blackwood Creek.]

While the presumed hypotheses and conceptual models of various physical and biological processes were partially implicit in the project goals, these should be made explicit for more transparency in the studies and possible revision in future monitoring efforts directed at improving the state of restoration knowledge for west-shore tributaries of Lake Tahoe. Taken within a watershed framework, it is likely that upper watershed landscape conditions (sediment source areas) would be addressed first prior to floodplain channel restoration, though an attempt was made in this regard with the culvert replacement mid-watershed in earlier phases of the restoration work and various other upslope projects.² Of course, such work is beset with the long-recognized uncertainties inherent to ecological restoration (Ludwig et al., 1993) and as such is often cast within an adaptively-managed research perspective. However, recent advances in upslope or upland restoration and assessment can be integrated in an overall watershed approach, thus making connections between and outcomes of efforts more tangible. Further, without clear and defensible, ideally quantifiable assessment criteria, particularly sediment loading, assumptions built into the planning (sinuosity, channel form, etc.) will only be assessed against themselves. That is, if a specific channel form and sinuosity is expected to reduce sediment or redistribute it in a specific manner, without accurate stream sediment (water quality) monitoring, that assumption cannot be tested.

Overall, the project monitoring indicates that the Reach 6 restoration project has achieved or is on a trajectory towards achieving the particular goals outlined in the report. Despite differences in SCI techniques, lower floodplain channel geometry and bank stability has apparently improved in the 2-3 years following project completion. While riparian and aquatic habitat also appears to have improved, some issues remain as noted in the report about levels of LWD and aquatic invertebrate community structures in the floodplain and these are slated to be addressed in future monitoring efforts. In the itemized review above, I provide several suggestions about standardizing monitoring and sampling methods and other possible monitoring approaches that are hypothesis driven. I encourage the USFS to adopt a reporting standard that is similar to that of peer-reviewed applied science journals (e.g. all tables and figures should include all units, n values, etc.). At the same time, the somewhat tortured statistical analyses of flows and sediment loads (what units on axes?) was probably unnecessary as a simple comparison of the pre- and post-project data as provided clearly indicates that the project did not increase sediment transport.³ However, the overall project effects on suspended sediment transport downstream remain unknown without the outlet monitoring needed to verify this latter observation.⁴

Number: 1 Author: snorman Subject: Sticky Note Date: 1/12/2014 10:01:00 AM

Acquiring Water Quality monitoring data to evaluate a testable hypothesis related to Lake Tahoe TMDL, is beyond the budget capacity of the Forest, as well as the LTIMP Interagency Monitoring Program. The Blackwood TMDL developed other less costly metrics that can provide better data regarding geomorphic process and response, in much shorter time periods. The USFS continues to support ranking Blackwood as a top priority for monitoring in the LTIMP program. Over the long term, we hope LTIMP data can will show Blackwood sediments loads are decreasing. But we will always rely on geomorphic data to provide a better picture of what processes are occurring within the Blackwood Creek.

Number: 2 Author: snorman Subject: Sticky Note Date: 9/19/2013 11:08:20 AM -07'00'

The upper watershed (above all stream channel restoration) is naturally erosive. All major upland restoration work (road decommissioning and upgrades) has already been implemented. We have added some discussion to clarify this.

Number: 3 Author: snorman Subject: Sticky Note Date: 9/19/2013 11:09:32 AM -07'00'

Not sure what figures /analysis you are referring to, but have fixed axis labels, so hopefully this eliminates confusion.

Number: 4 Author: snorman Subject: Sticky Note Date: 1/12/2014 10:02:45 AM

It was not the goal of this report, to make any quantified claims about overall changes in watershed loading. We can only assert that sediment is aggrading in this reach, and less erosion is occurring, than in the pre-project condition. Analysis will be conducted at the watershed scale in the future, based on recommendations by all the peer reviewers.

References

- DRERIP. 2005. Framework for the Development of DRERIP Ecosystem Conceptual Models.
<http://www.dfg.ca.gov/delta/erpdeltaplan/docs/Framework%20for%20the%20Development%20of%20DRERIP%20Ecosystem%20Conceptual%20Models%20053105.pdf>
- Grismer, M.E. 2012. Detecting Soil Disturbance/Restoration effects on Stream Sediment Loading in the Tahoe Basin – Modeling Predictions. Hydrological Processes DOI: 10.1002/hyp.9554.
- Grismer, M.E. 2013a. Stream Sediment and Nutrient Loads in the Tahoe Basin – Estimated versus Monitored Loads for TMDL “Crediting”. Environmental Monitoring & Assessment. DOI: 10.1007/s10661-013-3142-2.
- Grismer, M.E. 2013b. Soil Disturbance/Restoration effects on Stream Sediment Loading in the Tahoe Basin – Detection Monitoring. Environmental Monitoring & Assessment. Submitted.
- Herrick, J.E., G. E. Schuman and A. Rango. 2006. Monitoring ecological processes for restoration projects. J. Nature Conservation 14:161-171.
- Ludwig, D., R. Hilborn and C. Waters. 1993. Uncertainty, resource exploitation and conservation: Lessons from history. Science 260:17,36.




**REVIEWER 3: TAHOE SCIENCE CONSORTIUM PEER REVIEW
USFS - LAKE TAHOE BASIN MANAGEMENT UNIT
(MARCH – APRIL 2013)**

BLACKWOOD REACH 6 RESTORATION DESIGN PLANS

Peer Review Questions:

1. Are the analysis techniques presented in the report technically sound (i.e., are there identifiable flaws in the data analysis that compromises the accuracy of the derived results)?

In general, the analysis methods utilized do not fully support the results or conclusions presented. The biggest flaws are related to;

- Monitoring frequency. While much pre-project data was collected only 1 data set of post project monitoring was collected. Drawing significant conclusions from 1 instance of post project data is difficult at best  ¹
- Quantifiable metrics to support restoration goals. Goals 1 and 2 have quantifiable metrics that can easily be measured and supported by data. However metrics used to support goals 3, 4, 6 are quasi-subjective (“improve”) and open to interpretation. Better quantifying pre-project goals will improve the ability of the review team and designers to determine whether the project succeeded in its original intent and future restoration project  ²
- Reference reach methods. Given historic and extensive impacts to Blackwood Creek up and downstream of the restoration project, these reaches (if no restoration has been implemented) do not provide an appropriate condition to evaluate the effectiveness of this project. While using these reaches does provide a relative measure of effectiveness using a less impacted or pristine reach within the watershed or nearby would be a more appropriate measure  ³

Summary of Comments on Microsoft Word - Embertson Blackwood Canyon Review V2.docx

Page: 1

Number: 1 Author: snorman Subject: Sticky Note Date: 9/19/2013 11:34:23 AM -07'00'


We agree, that this just presents a snap shot in time. The purpose is, to determine whether project outcomes were moving in the right trajectory, and whether adaptive management was necessary.
We believe the report is clear on this intent, and the need for long term monitoring.


Number: 2 Author: snorman Subject: Sticky Note Date: 9/19/2013 11:39:55 AM -07'00'


We understand the discomfort some have with not establishing firm numeric targets to define "success", for every metric analyzed, but this is not realistic. With the exception of the Blackwood TMDL targets, and state thresholds for macroinvertebrates, established numeric targets to define success do not exist. Success will be determined based on measuring trends in metrics that describe ecosystem function, and showing improvement in that function, and when applicable, movement closer to values measured in reference reaches or values established in literature for highly functioning systems.

Number: 3 Author: snorman Subject: Sticky Note Date: 6/5/2013 4:06:41 PM -07'00'


There are no more appropriate reaches within this or adjacent watersheds, we have looked into this extensively. We are utilizing the best that is available, and believe these will have value for not only comparison to the restored reaches, but also for assessing overall trends at the watershed scale. Will add citation from Swanson study that supports our rationale.

- Consistency of data collection methods. Both sampling methodology and frequency was not consistent throughout pre and post project conditions. For instance, taken from page 7 of the report “some differences in sampling frequency and methodology used to collect data for particular metrics” While identified within the monitoring report as a flaw little discussion or extrapolation for how different methodologies and frequencies might affect the results and conclusions is provided. 

Lack of post project channel cross sections and floodplain survey. Post project topographic and cross section surveys are frequently used data to evaluate restoration success particularly for geomorphic and aquatic habitat criteria and appear and do not appear to have been performed. Especially in instances where extensive pre-project information was collected 

- Lack of synthesis from other data sources and analysis. Many references were sighted within the monitoring report with conclusions re-stated. However, it is unclear how supporting data was collected and analyses performed in order to support the conclusions provided. 

2. Have the identified flaws in the sampling design and sampling implementation been sufficiently described and appropriately considered in the analysis?

Known flaws in sampling methodology have been mentioned however it is unclear what the anticipated effects of the different sampling methodologies are on the results 

3. Are the conclusions regarding restoration effectiveness reasonable, based on the analysis?

The conclusions regarding effectiveness are only moderately supported based upon the analysis presented within the monitoring report. A summary per goal is as follows;

- Goal 1 – Analysis and conclusions for this goal are well supported and presented.

■ Number: 1 Author: snorman Subject: Sticky Note Date: 6/5/2013 4:09:16 PM -07'00'

We are not aware of any method to "extrapolate". However we will expand our discussion regarding how the flaws in or data collection may effect the level of certainty regarding our analysis and conclusions.

■ Number: 2 Author: snorman Subject: Sticky Note Date: 9/19/2013 11:45:30 AM -07'00'





Agreed, in 2011 and 2012, as we established 12 cross sections, which extend across the floodplain, in all three reaches, which will be used in future anlaysis. Will make that clear in the report.

■ Number: 3 Author: snorman Subject: Sticky Note Date: 9/19/2013 11:45:56 AM -07'00'

These sources are available on our website and/or from our agency if someone was really interested in digging into it at that level, either because they doubted the veracity of the conclusions, or were just interested in knowing more. For the purposes of keeping the length and complexity of this report manageable we believe referencing is sufficient.

■ Number: 4 Author: snorman Subject: Sticky Note Date: 1/12/2014 10:17:26 AM

We had the choice of not using the data we had available because there was flaws, or presenting the information we had as best we could. We do not have resources/funding to collect more data to quantify uncertainty where it exists, nor do we think that is necessary. We believe that reasonable interpretations have been made, within the identified data flaws.

- Goal 2 – Analysis and conclusions for the goal are well supported however it is unclear whether flows exceeding 250cfs actually inundated the restored floodplain, as implied.
 - Goal 3 – Analysis and conclusions are only moderately supported. While sampling methodology is discussed no data other than visual observations are presented with the report. Results from sample plots that include vegetation species, size, and frequency would better support the evaluation of this goal. ¹
 - Goal 4 - Analysis and conclusions are only moderately supported. While, it is apparent other documents and analyses have been performed related to this goal no methods/results/conclusions are well supported. It is unclear how 142 tons of sediment was determined to be stored on the floodplain. The most defensible method to determine this value would be accomplished through post project topographic survey (either through cross sections or full topo) of the restored reach. While model results are presented are interesting monitoring for this goal is best measured through actual geomorphic change within the channel and floodplain. ²
 - Goal 5 – Analysis and conclusions are only moderately supported. While many different factors to habitat quality are presented (pool quality, stream sediment size, shading, entrenchment, and cross sections, LWD) lack of pre project, post project (cross sections) data collection for these parameters limits the effectiveness conclusions. ³
 - Goal 6 - Analysis and conclusions are only moderately supported. As stated in the report “results present somewhat of a mixed story when comparingIBI and O/E metrics”. The broader question related to this goal is how the IBI and O/E metrics inform the evaluation of effectiveness for this project. The more appropriate way to evaluate this metric is to compare pre- and post-project information on invertebrates within the restored reach. ⁴
4. Do you have any suggestions for improving the clarity, quality, completeness of the analysis and interpretation of results (based

■ Number: 1 Author: snorman Subject: Sticky Note Date: 9/19/2013 11:48:21 AM -07'00'

That is because it is to soon after restoration to make that type of data collection meaningful, it would be a waste of money at this point. Visual observations supported by photos are not meaningless. We made clear that vegetation goals have not, and were not expected to be achieved in this short time frame. Future vegetation monitoring will occur, to assess whether we have met the TMDL target for this metric.

■ Number: 2 Author: snorman Subject: Sticky Note Date: 1/12/2014 10:19:02 AM

This conclusion is based on the results presented in a completed masters thesis (which was defended through the academic process), and is available on our website. We have established additional cross sections, which will enable us to utilize the methods you describe in future analyses.

■ Number: 3 Author: snorman Subject: Sticky Note Date: 1/12/2014 10:19:52 AM




USFS Stream Condition Inventory procedures are widely considered and accepted as useful measures of habitat quality. Cross sections provide a piece of the useful data within the body of data collected using SCI, and as stated above have added many cross-sections throughout Blackwood creek.

■ Number: 4 Author: snorman Subject: Sticky Note Date: 1/12/2014 10:21:02 AM

The art and science of macro-invertebrate analysis is still being developed at the state and federal level (including establishing relevant standards) , so we do not have the ability to do a better job at this than the state of the science. As stated in the report, we will be deferring to TRPA for measurement of this metric the future, and expect to utilize this metric to measure overall watershed health, more so then evaluate individual project effectiveness.

on available data), to support conclusions regarding restoration effectiveness?

To improve the quality and conclusions of the restoration effectiveness the following would be helpful;

- Collect quantifiable field data within the restored reach on a more frequent basis. While much data has been collected there is only 1 measurement post project (while 3-5 pre project). From this it is difficult to conclusively state trends in physical and biologic change as a result of the restoration project. ¹
- Utilize standardized field methods to ensure different data sets are easily comparable. ²
- In addition to channel profiles collect channel cross section and floodplain data to measure any physical changes within the project area. ³

Number: 1 Author: snorman Subject: Sticky Note Date: 1/12/2014 10:21:51 AM

We do not agree that data needs to be collected more frequently, however we do agree that data needs to be collected over a longer duration (which is described in our monitoring plan) to determine long term trends in physical and biological change. The next major phase of post project data collection is scheduled for 2015, and will assess condition at the watershed/stream scale. Have added language clarifying this intent in the report.

Number: 2 Author: snorman Subject: Sticky Note Date: 6/5/2013 5:06:34 PM -07'00'

Standardized field methods were and will continue to be applied.

Number: 3 Author: snorman Subject: Sticky Note Date: 6/5/2013 5:07:20 PM -07'00'

As stated previously, additional X-sections in all three reaches have been established.
